PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-258605

(43)Date of publication of application : 24.09.1999

(51)Int.Cl. G02F 1/1335
G02F 1/1337

(21)Application number : 11-016319

(22)Date of filing : 25.01.1999

(71)Applicant : FUJITSU LTD

(72)Inventor : TAKEDA ARIHIRO
KOIKE YOSHIRO
SASAKI TAKAHIRO
MURATA SATOSHI
HASEGAWA TADASHI
INOUE HIROYASU
OTANI MINORU
IKEDA MASAHIRO
TANIGUCHI YOJI
YOSHIDA HIDESHI
TSUDA HIDEAKI
OMURO KATSUFUMI
SENDA HIDEO
TSUKADAI KOUJI
TASAKA YASUTOSHI
OKAMOTO KENJI
MAYAMA TAKEMUNE
TANUMA SEIJI
NAKANISHI YOHEI
TASHIRO KUNIHIRO
KATAOKA SHINGO
OHASHI MAKOTO
YAMAGUCHI HISASHI
MORISHIGE OSAMU
FURUKAWA KUNIAKI
KAMATA TAKESHI
TANAKA YOSHINORI
HOSHINO ATSUYUKI
HAYASHI SHOGO
TAKIZAWA HIDEAKI
KANESHIRO TAKESHI
KITSUKI MAKOTO
IMOTO KEIJI
SASABAYASHI TAKASHI
FUJIKAWA TETSUYA
SAWAZAKI MANABU
TANOSE TOMONORI
HIROTA SHIRO

(30)Priority

Priority number : 09155437 Priority date : 12.06.1997 Priority country : JP
09230982 27.08.1997

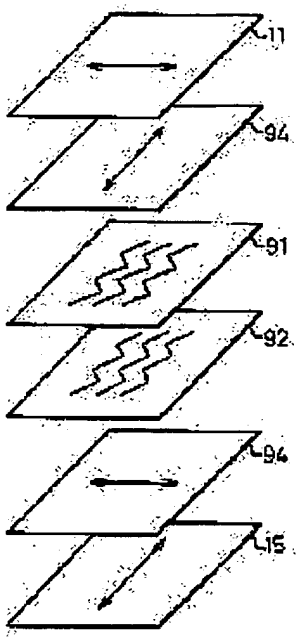
09230991	27.08.1997	JP
09266937	30.09.1997	
09361384	26.12.1997	JP
		JP
		JP

(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To actualize the VA type liquid crystal display device which has excellent visual angle characteristics while maintaining excellent contrast, an excellent operating speed, etc., as usual.

SOLUTION: Liquid crystal 14 having negative dielectric constant anisotropy is sandwiched between 1st and 2nd substrates 91 and 92 whose surfaces are aligned vertically and on at least on surface of the upper and lower two substrates, a domain restricting means consisting of a protrusion, a recess, a slit formed in an electrode, or their combination is provided. Further, this device is equipped with a VA type liquid crystal panel which restricts the alignment of the liquid crystal so that the liquid crystal is aligned in plural oblique direction in each pixel, 1st and 2nd polarizing plates 11 and 15 are arranged on both the sides of the liquid crystal panel so that their axes of absorption cross each other at right angles, and at least one phase difference film 94 is arranged between the liquid crystal panel and the 1st or 2nd polarizing plate. In this case, the phase difference film has the relation nx, ny≥nz, where nx and ny are the refractive indexes in a film intra-surface direction and nz is a refractive index in the thickness direction.



LEGAL STATUS

[Date of request for examination]	25.01.1999
[Date of sending the examiner's decision of rejection]	26.02.2002
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	2002-05351
[Date of requesting appeal against examiner's decision of rejection]	28.03.2002
[Date of extinction of right]	

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. It is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed. Either of the slits prepared in one [at least] front face of the substrate of two aforementioned upper and lower sides at the salient, the hollow, or the electrode, Or the liquid crystal panel regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when it has the domain regulation means which consists of those combination and voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. It is arranged at least at one side between one aforementioned liquid crystal panel side, the above 1st of both sides, or the 2nd polarizing plate of the above, and is nz about the refractive index of nx, ny, and the thickness direction in the refractive index of field inboard. Phase contrast film of at least one sheet which has the relation of nx and ny >=nz (however, nx =ny =nz removes) when it carries out.
[Claim 2] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. It is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed. Either of the slits prepared in one [at least] front face of the substrate of two aforementioned upper and lower sides at the salient, the hollow, or the electrode, Or the liquid crystal panel regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when it has the domain regulation means which consists of those combination and voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. Even if it equips at least one side between one aforementioned liquid crystal panel side, the above 1st of both sides, or the 2nd polarizing plate of the above with the phase contrast film of at least one sheet and this ** cannot be found, the phase contrast film of one sheet is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx >ny =nz. Relation.
[Claim 3] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. It is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed. Either of the slits prepared in one [at least] front face of the substrate of two aforementioned upper and lower sides at the salient, the hollow, or the electrode, Or the liquid crystal panel regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when it has the domain regulation means which consists of those combination and voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. Even if it equips at least one side between one aforementioned liquid crystal panel side, the above 1st of both sides, or the 2nd

polarizing plate of the above with the phase contrast film of at least one sheet and this ** cannot be found, the phase contrast film of one sheet is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx =ny >nz. Relation.

[Claim 4] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. It is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed. Either of the slits prepared in one [at least] front face of the substrate of two aforementioned upper and lower sides at the salient, the hollow, or the electrode, Or the liquid crystal panel regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when it has the domain regulation means which consists of those combination and voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. The 1st phase contrast film prepared between the aforementioned liquid crystal panel and the 1st polarizing plate of the above. It has the aforementioned liquid crystal panel and the 2nd phase contrast film prepared between the 2nd polarizing plate of the above. the phase contrast film of the above 1st The refractive index of film plane inboard parallel to the absorption shaft of the 1st polarizing plate of the above ny, It is nx about the refractive index of film plane inboard perpendicular to it. It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx >ny =nz. It has a relation. the phase contrast film of the above 2nd It is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is the relation of nx =ny >nz.

[Claim 5] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. It is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed. Either of the slits prepared in one [at least] front face of the substrate of two aforementioned upper and lower sides at the salient, the hollow, or the electrode, Or the liquid crystal panel regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when it has the domain regulation means which consists of those combination and voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. The 1st phase contrast film prepared between the aforementioned liquid crystal panel and the 1st polarizing plate of the above. It has the 1st polarizing plate of the above, and the 2nd phase contrast film prepared between the phase contrast films of the above 1st. the phase contrast film of the above 1st The refractive index of film plane inboard parallel to the absorption shaft of the 1st polarizing plate of the above ny, It is nx about the refractive index of film plane inboard perpendicular to it. It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx >ny =nz. It has a relation. the phase contrast film of the above 2nd It is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx =ny >nz. Relation.

[Claim 6] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. It is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed. Either of the slits prepared in one [at least] front face of the substrate of two aforementioned upper and lower sides at the salient, the hollow, or the electrode, Or the liquid crystal panel regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when it has the domain regulation means which consists of those combination and voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. The 1st phase contrast film prepared between the aforementioned liquid crystal panel and the 1st polarizing plate of the above. It has the aforementioned liquid crystal panel and the 2nd phase contrast film prepared between the phase contrast films of the above 1st. the phase contrast film of the above 1st The refractive index of film plane inboard parallel to the

absorption shaft of the 1st polarizing plate of the above ny, It is nx about the refractive index of film plane inboard perpendicular to it. It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx >ny =nz. It has a relation. the phase contrast film of the above 2nd It is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. It is nx =ny>nz when it carries out. Relation.

[Claim 7] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. The liquid crystal panel which is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed, and is regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. Even if it equips at least one side between one aforementioned liquid crystal panel side, the above 1st of both sides, or the 2nd polarizing plate of the above with the phase contrast film of at least one sheet and this ** cannot be found, the phase contrast film of one sheet is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx >ny =nz. Relation.

[Claim 8] The liquid crystal display characterized by providing the following. A dielectric constant anisotropy pinches negative liquid crystal between the substrates of two upper and lower sides which performed perpendicular orientation processing to the front face. The orientation of the aforementioned liquid crystal becomes almost level, when predetermined voltage is mostly impressed at a perpendicular at the time of no voltage impressing. The liquid crystal panel which is the orientation which becomes slanting when voltage smaller than the aforementioned predetermined voltage is impressed, and is regulated so that the direction where the orientation of the aforementioned liquid crystal becomes slanting may come in two or more directions in each pixel, when voltage smaller than the aforementioned predetermined voltage is impressed. The 1st and the 2nd polarizing plate which have been arranged at the both sides of the aforementioned liquid crystal panel so that a mutual absorption shaft may intersect perpendicularly. Even if it equips at least one side between one aforementioned liquid crystal panel side, the above 1st of both sides, or the 2nd polarizing plate of the above with the phase contrast film of at least one sheet and this ** cannot be found, the phase contrast film of one sheet is nx about the refractive index of film plane inboard. And ny It carries out and is nz about the refractive index of the thickness direction. When it carries out, it is nx =ny >nz. Relation.

[Translation done.]